

Radon Sentinel™ User's Guide

ACCURATE • RELIABLE • ECONOMICAL



User's Guide, Radon Sentinel

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This guide is written for:

PC software: version 3.0.2

Embedded firmware: version 1.0

The Model 1030 Radon Sentinel is protected by U.S. Patent #4,871,914.

Radon Sentinel™ is a trademark of Sun Nuclear Corporation.

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Preface

Intended Use

The Model 1030 Radon Sentinel is intended to be used by radon measurement professionals for measurement of the indoor radon level in human dwellings.

Typical Application



CAUTION: Radon Sentinel Model 1030 should be used for indoor applications only. Using in an outdoor environment may cause errors due to humidity and extreme temperatures.

For a typical test, place the Radon Sentinel in a building or structure to be monitored, connect power, and leave it unattended for the required test period. Ambient room air, laden with radon, diffuses into the radon monitor's detection chambers. Gaps between the base and the cover allow air to freely pass into the radon monitor. Radon decay by-products emit alpha particles which are detected by the photo diodes and then counted. During a test, the number of counts produced by the alpha particles is stored in memory and converted into radon concentration (pCi/l) using the stored calibration factor.

At the end of the test period, the results can be viewed on the radon monitor display, on a computer screen, or in a printed report. After viewing or printing the report data, clear the memory. Two tests can be stored before the memory is cleared; the second test in memory is intended for use as a backup in case the data cannot be conveniently downloaded. The radon monitor can be moved from the test site, and the report printed later. The instrument is completely reusable and requires no supplies except line power and/or four size C batteries.

Health and Safety Instructions



WARNING: Never use the radon monitor in an area that could contain explosive gases. A spark from inside the radon monitor could ignite an explosion.

- To protect insulation, never pull on a cable to disconnect it. Always grasp the plug or connector.
- Inspect the device periodically for damage. If measurement errors or device damage are suspected, contact Sun Nuclear Corporation.

Regulatory Information

For a definition of the symbols used throughout this document and additional information related to user and device safety, see *Regulatory Supplement* on page 31. Review this information thoroughly before setting up and using the instrument.

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Introduction

Description

The Radon Sentinel is a patented detection device to measure the concentration of radon gas. The unit is designed for professional inspectors to use in homes and buildings. The Radon Sentinel is a continuous radon monitor that can be operated using an AC adapter or four size C alkaline batteries.

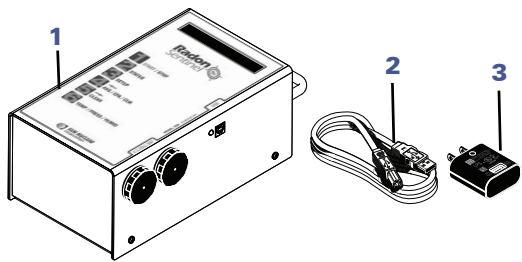
The 16-character display on the Radon Sentinel shows instructions and radon readings. Buttons below the display are used to enter data, set parameters, and display data values. The Radon Sentinel connects to a computer via a USB cable and the Continuous Radon Monitor software can then be used to download measurements, set parameters, and print reports. See *Radon Monitor Software* on page 11.



Note: Radon support is available 24 hours a day, 7 days a week on the Sun Nuclear Support web site: www.sun-nuclear.com/support. For more information, see *Contacting Sun Nuclear Support* on page 30

Parts

Unpack the Radon Sentinel and verify that the parts described below are included in the package. When unpacking, save the packing material to use when sending the Radon Sentinel to Sun Nuclear Corporation for annual calibration.



No.	Part Number	Description
1	1030300	Model 1030 Radon Sentinel
2	801041 *	Cable, USB, 2 m
3	741001 *	AC to USB power adapter, 5VDC, 100-240V, USB
—	1029030 *	CD, software and reference information (not shown)
—	1030012	User's Guide (on CD)
—	1030013 *	Getting Started Guide (not shown)

* Included with the Radon Sentinel but may be ordered as an accessory.

Figure 1. Parts Furnished with Model 1030 Radon Sentinel

Options and Accessories

Contact Sun Nuclear Corporation to order any of the following accessories.

Table 1. Radon Sentinel Accessories

Part Number		Description
102378	Sign, self-adhesive, "Warning, Closed Building Procedure"	
102379	Sign, plastic, hanging, "Caution, Radon Test in Progress"	
1028130	Sign, vinyl static cling, "Warning, Closed Building Procedure"	
1030000-SC	Heavy duty case (for Radon Sentinel, Model 1030 only)	

Radon Sentinel Operation

Connecting Power

The Radon Sentinel can be operated on battery power or it can be connected to AC power. When the Radon Sentinel is connected to AC power, the battery provides back-up power.

Inserting Batteries

Disconnect the Radon Sentinel from AC power before installing batteries. A new set of four size C alkaline batteries will operate the device for 300+ hours.



CAUTION: High humidity may shorten battery life. Connect the AC power adapter when using the Radon Sentinel in areas with high humidity.

The battery compartment is accessed from the right side panel of the Radon Sentinel (Figure 2). Replacement batteries can be purchased from any retail source.

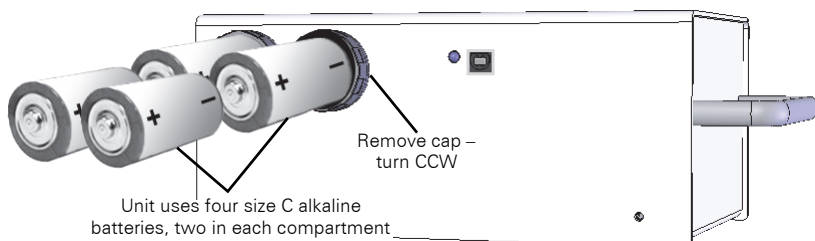


Figure 2. Inserting Batteries

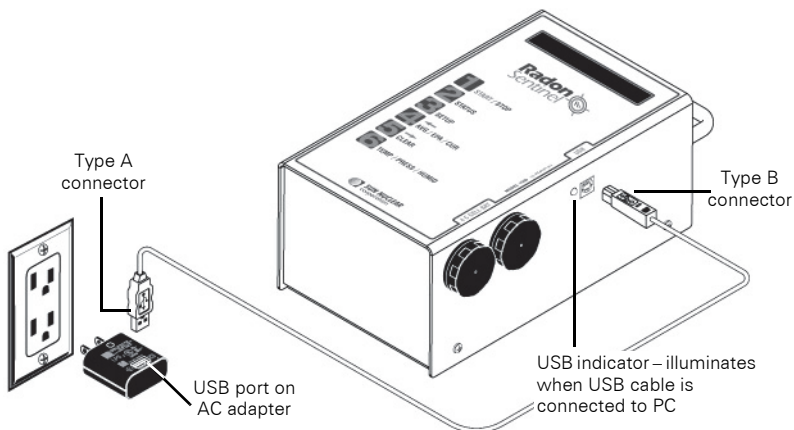
- 1** Remove the cap from one of the battery compartments by rotating it counterclockwise.
- 2** Insert two size C alkaline batteries, so that the negative end of the battery goes into the compartment first (Figure 2).
- 3** Replace the battery compartment cap by pressing down on the cap while turning it clockwise until it is tight.
Tip: Use two hands — hold cap down with your thumb and use your other hand to tighten the cap. If cap is cross-threaded, remove it and realign threads.
- 4** Repeat steps 1 through 3 for the other battery compartment.

Connecting the AC Adapter

Use these instructions when using AC power for the primary power source and the batteries as backup.

- 1 Connect USB cable type A connector to USB port on AC adapter (Figure 3).

Figure 3. Connecting Power to the Radon Sentinel



- 2 Plug USB cable type B connection into USB port on right side panel of Radon Sentinel.
- 3 Plug AC adapter into a 120-240 VAC, 50-60 Hz wall outlet.

Turning on the Display

There is no power switch or key sequence to power on/off the Radon Sentinel. When the AC power adapter is connected, the monitor display is on continuously, indicating that the power is successfully connected. If power is removed or if running on batteries alone and no buttons are pressed for 3 minutes, the display turns off automatically.

If the display is not on, press any button. After a few seconds, the display turns on (Figure 4) and shows the battery status.

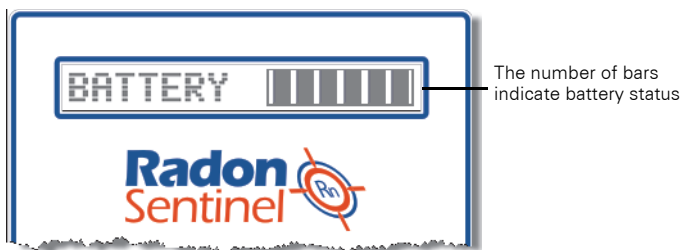


Figure 4. Turning on the Display

The display prompts for the PIN (personal identification number) entry (see *Personal Identification Number* on page 7). Then, the company name displays momentarily (if set up) followed by the message: *Ready to Test*.

If a test is not started, the settings for *Duration*, *Interval*, and *Delay* appear. If there is data in memory, the message *Data in Memory!* appears.

When *Ready to Test* displays, a test can be started, the setup can be changed, or status for the following can be displayed: EPA, average or current radon values, temperature, pressure, or humidity.

The display turns off automatically after approximately 3 minutes of inactivity when the AC power is not connected. There is not an OFF switch or key sequence to power off.

Controls

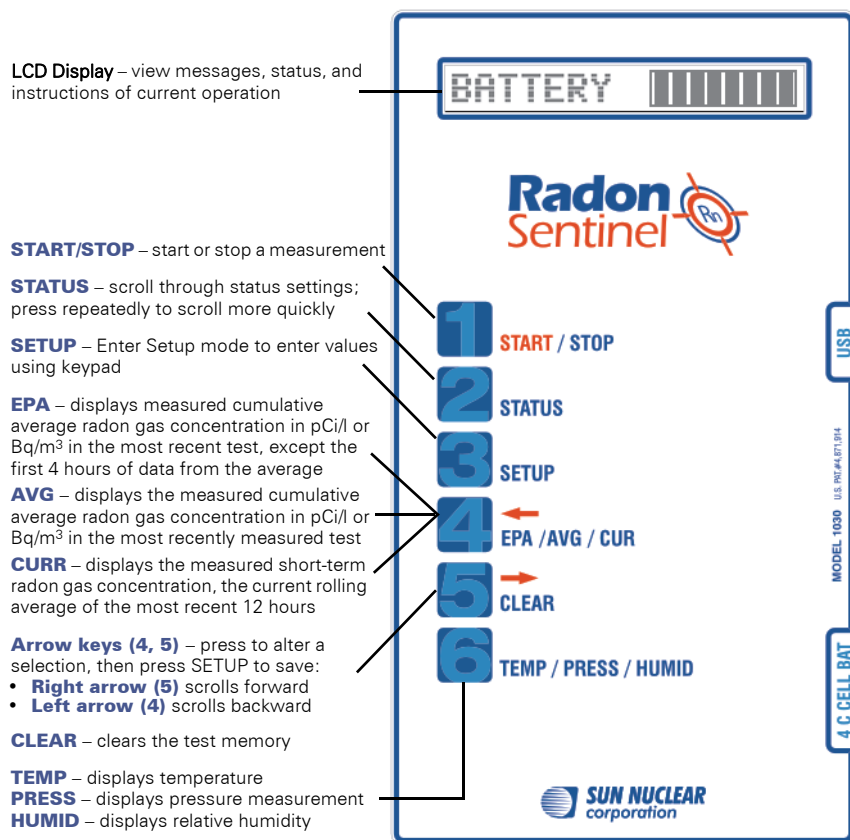


Figure 5. Controls

Configuring Parameters



Note: *Changes to parameters affect future tests only. Measurements taken prior to the change will not be affected.*

General parameters for the Radon Sentinel can be configured using a computer. A limited set of parameters can be entered using the keys on the device (see *Set Parameters using Radon Sentinel Keys* on page 6). For instructions to enter company information using a computer, see *Configuring Company Information* on page 15

Set Parameters using Radon Sentinel Keys

Options for the following parameters can be changed using the keys on the device.

DELAY	Select the time delay for starting a test: 0, 12, 24, 48 (hours)
INTERVAL	Select measurement interval: 0.5, 1, 2, 4, 8, 12, 16, 20, 24 (hours)
DURATION	Select duration of the test: 1, 12, 24, 36, 48, 60, 72, 84, 96, 100, 999 (hours)
UNITS	Select the units for the test: pCi/l (picocuries per liter) or Bq/m ³ (becquerels per cubic meter).
PIN NUM	Set to any combination of four digits using the numbers 1 through 6; default setting is 1111. When the PIN is set to 1111, the Radon Sentinel does not prompt for a PIN.

Use the following procedure to change the parameters.

- 1 Press any key to turn on the unit.
- 2 Press **Setup** (3).
- 3 If prompted, enter the PIN. “*Setup Menu*” displays.
- 4 Press **Setup** (3) to scroll to the parameter to change.
- 5 When the parameter is displayed, press **Left Arrow** (4) or **Right Arrow** (5) to select the desired setting.

Exception: When setting the PIN, use the keys labeled 1 through 6 to enter a 4-digit PIN.

- 6 Press **Setup** (3) to save and advance to the next parameter.
- 7 Repeat steps 4 through 6 until the parameters are defined and “*Setup Menu Done*” displays.

The new parameters will apply to future tests.

Personal Identification Number

The prompt for entering the PIN appears when:

- The Radon Sentinel is turned on
- A test is started
- A test is stopped
- The setup is accessed
- EPA, average, or current value is requested during a measurement
- The memory is cleared

When a PIN is requested, if it is not entered within 10 seconds, the display clears (during a measurement, the Radon Sentinel returns to measurement mode). If an incorrect PIN is entered, the messages "*Do Not Tamper!*" and "*Illegal!*" will appear.



Note: When the PIN is requested and entered, the Radon Sentinel remains unlocked for 3 minutes.

Positioning the Monitor

- 1 Place the Radon Sentinel in the desired position in the area to be monitored for radon gas. The device does not need to be level.
- 2 To use a tripod, thread the standard tripod screw (1/4-20UNC) into threaded fitting on the bottom of the case.



Checking Unit Status

Figure 6. Using a Tripod

Before starting a test, it is a good practice to scroll through the parameters to ensure that they are correct.

- 1 Press any key to power on the display.
- 2 Press **Status (2)**.
- 3 The items in the status menu scroll automatically, or you can press **Status (2)** to scroll manually.

These status items can be displayed *during* a test by pressing any button and then pressing **Status (2)**.

To change the parameters, see *Configuring Parameters* on page 6.

Starting a Test

- 1 When “Ready to Test” appears on the display, press **Start / Stop (1)** to start a test.
- 2 “Starting Test” appears on the display followed by the settings defined for the test:

Memory One	Memory is checked. If data is found, memory must be cleared. See <i>Clearing Memory</i> on page 9.
Delay (# hours)	Displays the time delay defined in the setup. Note that the time shown for the customer report will be the time the actual measurement begins.
Interval (# hours)	Displays the measurement interval defined in setup.
Duration (# hours)	Displays the test duration defined in setup.
Testing (# hours)	The test has started and will be finished after the specified duration (plus any delay). The display turns off after a few minutes and remains off unless the test is terminated or the display is turned on.

Terminating a Test

To terminate a test in progress:

- 1 Press **Start / Stop (1)**.
- 2 The prompt, “Enter PIN”, displays. Use the number keys on the unit to enter the PIN.
- 3 “End Test Y=1 N=2” displays. Press **1** to end the test.
- 4 “Confirm Y=1 N=2” displays. Press **1** to confirm.
“Ending Test” displays briefly, followed by “Ready to Test” or, if both memory slots are full, “Memory Full” displays (see *Clearing Memory* on page 9).

Displaying EPA, Average, and Current Radon Values

The EPA, AVG (average) and CUR (current) radon values can be displayed on the Radon Sentinel during a test or after a test is completed (if the test data has not been cleared).

- 1 Press any button to turn on the display.
- 2 Press **EPA / AVG / CUR (4)** to view the EPA value (that is, the average radon concentration with the first four hours of measurement removed).
- 3 Press **EPA / AVG / CUR (4)** again to display the average radon concentration over the total monitoring period.
- 4 Press **EPA / AVG / CUR (4)** a third time to display the average radon concentration over the last 12-hour period.

Clearing Memory



Note: Before clearing the memory, ensure that any test data that you wish to save has been downloaded to your computer.

When the memory is full (that is, there are two tests in memory), the messages “Memory Full” and “Download Data” alternate on the Radon Sentinel display. These messages will appear when both memory slots have stored test data.

The memory is cleared using the keys on the Radon Sentinel. The instructions below are written for a unit with two tests in memory.

- 1** If a test is in progress, stop the test. See *Terminating a Test* on page 8.
- 2** Press **CLEAR (5)**.
- 3** “Clear Test 2” appears on the display briefly, followed by the prompt “Confirm Y=1 N=2”. Press **1** to continue.
- 4** “Test 2 Cleared” displays followed by the prompt “Clear Test 1”.
- 5** “Confirm Y =1 N=2” appears. Press **1** to confirm or **2** to keep Test 1 in memory.

Replacing the Batteries

When the batteries are low or need to be replaced, a message displays on the Radon Sentinel. The message will vary, depending upon whether an external power source is used.

Low/No Battery!	Battery does not have enough power for a 60-hour test.
Replace Battery!	Replace the batteries as soon as convenient. Current test can continue until complete if AC power is reliable. See <i>Inserting Batteries</i> on page 3.
Shutting down...	The system shuts down to save power.
No Extern. Power	AC power should be connected to continue the test. At the conclusion of the test, replace the battery.

Use the instructions below to replace the batteries.

- 1** If a test is in progress, connect the AC power adapter or wait for the test to complete.
- 2** Open battery compartments on right side panel and remove batteries.
- 3** Insert four fresh size C alkaline batteries. See *Inserting Batteries* on page 3.

Connecting Radon Sentinel to Computer

Connect the Radon Sentinel to a computer using the USB cable (furnished with the device). Multiple radon monitors may be connected simultaneously using the available USB ports on the computer, or using an external USB hub.

- 1** Connect the USB type A connector (Figure 7) to the computer or USB hub.

- 2** Connect the USB type B connector to the Radon Sentinel.

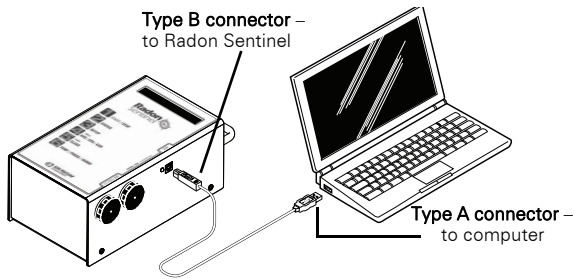


Figure 7. USB Connectors



Note: If using multiple Radon Sentinels, the 'Device Driver Installation Wizard' will run when each device is initially connected to the computer. Accept the defaults for the installation. The device is ready to use when 'Ready to use' appears in the system tray.

Disconnecting the Radon Sentinel

From the system tray, click the icon (Figure 8) to safely remove hardware and then click on the Radon Sentinel device.

Windows XP system tray icon:
Safely Remove USB Mass Storage
Device



Windows 7 system tray icon:
Safely Remove Hardware and
Eject Device

Figure 8. System Tray Icons, Safely Remove Hardware

Radon Monitor Software

About the Software

The Continuous Radon Monitor software can be used to:

- Enter parameters and transfer those parameters to the Radon Sentinel
- Transfer report data from the Radon Sentinel to the computer
- Add customer information and test conditions to a report
- Print reports on any available printer

Recommended System Requirements

To view the recommended system requirements for the software, see *Radon Software Recommended System Requirements* on page 26.

Installing Software

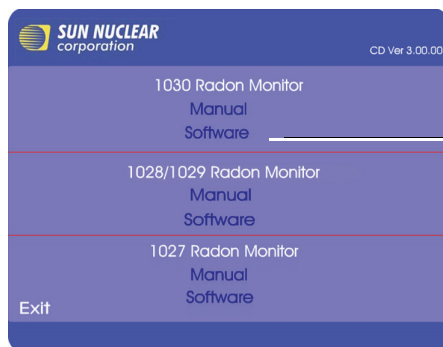
Use the installation instructions for the type of operating system that is running on your computer: Windows XP or Windows 7. The user logged in to the computer must have administrative rights to perform the installation.



Note: The Radon Sentinel device drivers are installed automatically as part of the software installation.

Installing on Windows XP Operating System

- 1 Connect the Radon Sentinel to the computer, then insert the CD in the CD drive.
- 2 When the install menu opens, select the **Software** link below the **1030 Radon Monitor** section.



Software link for
1030 Radon Monitor

Figure 9. Radon Monitor Installation Menu

- 3 The 'Radon Monitor – InstallShield Wizard' starts and checks for the presence of Microsoft .NET Framework 4.0 on the computer.
 - If Microsoft .NET Framework is present on the computer, continue to step 4.
 - If it is not found, a screen opens prompting for the installation. Click **Install**. If prompted to reboot the computer when the Microsoft .NET Framework installation completes, click **YES**. The software installation will continue when the computer is restarted.



Note: Microsoft .NET Framework must be installed for the Continuous Radon Monitor software installation to continue.

- 4 The 'Radon Monitor – InstallShield Wizard' welcome screen opens. Click **Next**.
- 5 The License Agreement screen displays (Figure 10). Read and accept the terms of the license agreement and click **Next**.

Accept the terms of the license agreement

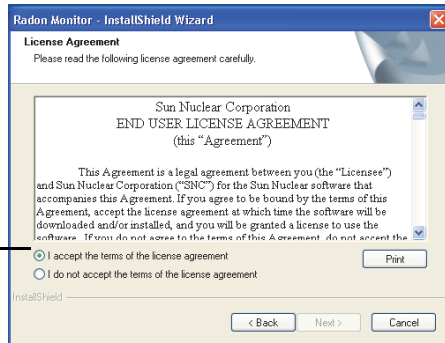


Figure 10. End User License Agreement, Windows XP

- 6 Follow the on-screen instructions to complete the software installation, accepting the default folders and file locations.
- 7 When the 'SNC Driver Installer' window opens, click **Next**. The device drivers are installed and then the driver status ('Ready to use') displays in the system tray.



Note: Two device drivers will be installed so the 'SNC Driver Installer' may run twice.

- 8 When the drivers are installed, the 'SNC Driver Installer' window displays the drivers that were installed. Click **Finish**.
- 9 The 'Radon Monitor - InstallShield Wizard' window displays. Click **Finish** to exit the wizard, then remove the CD.

Installing on Windows 7 Operating System

When installing the Radon Monitor software on a computer running the Windows 7 operating system, it must be installed using the **Run as administrator** option.

- 1 Connect the Radon Sentinel to the computer, then insert the CD in the CD drive. When the autoplay window opens, click **I Decline** to close the window that warns that the program is protected by copyright law.
- 2 Navigate to the following directory on the CD:
FsCommand\Radon\Software\1030.
- 3 Right-click on **Radon1030.exe** and select **Run as administrator**.
- 4 The 'Radon Monitor – InstallShield Wizard' starts and checks for the presence of Microsoft .NET Framework 4.0 on the computer.
 - If Microsoft .NET Framework is present on the computer, continue to step 4.
 - If it is not found, a screen opens prompting for the installation. Click **Install**. If prompted to reboot the computer when the Microsoft .NET Framework installation completes, click **YES**. The software installation will continue when the computer is restarted.



Note: Microsoft .NET Framework must be installed for the Continuous Radon Monitor software installation to continue.

- 5 The 'Radon Monitor – InstallShield Wizard' welcome screen opens. Click **Next**.
- 6 The License Agreement screen displays (Figure 11). Read and accept the terms of the license agreement and click **Next**.

Accept the terms of the license agreement

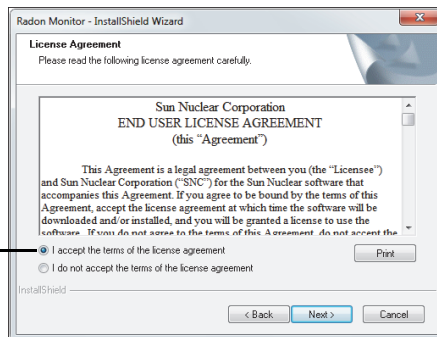


Figure 11. End User License Agreement, Window 7

- 7 Follow the on-screen instructions to complete the software installation, accepting the default folders and file locations.
- 8 When the 'SNC Driver Installer' window opens, click **Next**.

- A Windows Security prompt may appear asking for confirmation to install the CDM Driver Package (this prompt will appear twice because two drivers will be installed). Click **Install**.
- The device drivers are installed and then the driver status ('Ready to use') displays in the system tray.



Note: Two device drivers will be installed so the 'SNC Driver Installer' may run twice.

- 9 When the drivers are installed, the 'SNC Driver Installer' window displays the drivers that were installed. Click **Finish**.
- 10 The 'Radon Monitor - InstallShield Wizard' window displays. Click **Finish** to exit, then remove the CD.

Launching the Software

Launch the software application by double-clicking the **Radon Monitor** desktop shortcut  or by selecting **Start > All Programs > Sun Nuclear > Radon Monitor**. The Radon Sentinel does not have to be connected when the software is launched. For details about the software, see *Software Setup* on page 15.

Closing the Software

To close the Continuous Radon Monitor software, click the **Close** button  in the top right corner of the window.

Software Setup

Tabs on the main screen provide access the panels for setting up company information, customer information, retrieving data, and generating reports. The toolbars at the top of the screen offer buttons for performing functions when working with data (Figure 12).

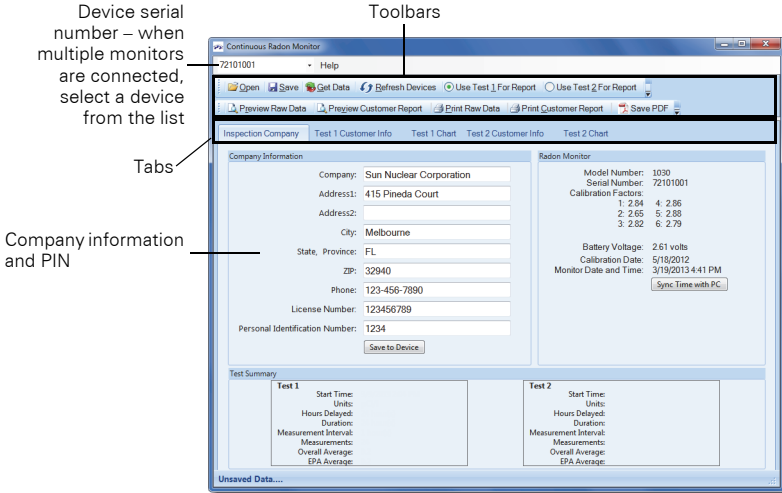


Figure 12. Main Screen, Inspection View

Configuring Company Information

The *Inspection Company* tab is used to enter or maintain details about an inspection company. Upon initial use of a Model 1030 Radon Sentinel, this tab is used to configure information such as the name of the inspection company, address, phone number, etc. The information entered on this screen is uploaded to the Radon Sentinel, and is used in reports.



Note: The only data required on the *Company Information* panel is the *Personal Identification Number (PIN)*. By default, the PIN is set to 1111.

The company name, address, telephone number, and license number are optional; however, if this information is not entered, reports that are generated using the Continuous Radon Monitor software will not display the company information.

- 1 Connect the Radon Sentinel to the computer and then start the Continuous Radon Monitor software.
- 2 If more than one device is connected, select the device to work with from the drop-down list above the toolbar.
- 3 Enter the company name, address, telephone number and license number.

(space) ! " # \$ % & ' () * + , - . / 0 1 2 3 4 5 6 7 8 9 : ; < = > ? @ [\] ^ _ ' Upper and lower case alpha characters, A-Z, a-z



Note: We recommend entering a Personal Identification Number (PIN) to protect the data from interference by parties other than the radon tester. If the default PIN (1111) is used, changes can be made to settings on the Radon Sentinel without entering a PIN.

- 4 If desired, change the Personal Identification Number. The PIN must consist of four digits using any combination of the numbers 1 through 6.
- 5 After entering data, click **Save to Device** to initiate the data transfer to the Radon Sentinel.
 - If invalid characters are entered for the PIN, an error message appears stating that the Personal Identification Number did not save to the device.
 - Click **OK** to close the error message, enter a four-digit PIN using only the numbers 1 through 6, and then click **Save to Device**.

Editing Company Information

- 1 Connect the Radon Sentinel to the computer and start the Continuous Radon Monitor software.
- 2 If more than one device is connected, select the device to work with from the drop-down list above the toolbar and then click **Get Data**.
- 3 Make any necessary changes and then click **Save to Device** to transfer the data to the Radon Sentinel.

Radon Monitor Details

The *Inspection Company* tab displays details about the Radon Sentinel: model number, serial number, calibration factors (determined during factory calibration), battery voltage, calibration date, and the date and time from the Radon Sentinel. This view can also be used to synchronize the date and time from the computer with the Radon Sentinel.

The data in this panel cannot be edited.

- 1 Connect the Radon Sentinel to the computer and start the Continuous Radon Monitor software.
- 2 If more than one device is connected, select the device to work with from the drop-down list above the toolbar and then click **Get Data**.

Information about the selected radon monitor displays (Figure 13).

- 3 To synchronize the time on the Radon Sentinel with the time on the computer, click **Sync Time with PC**.

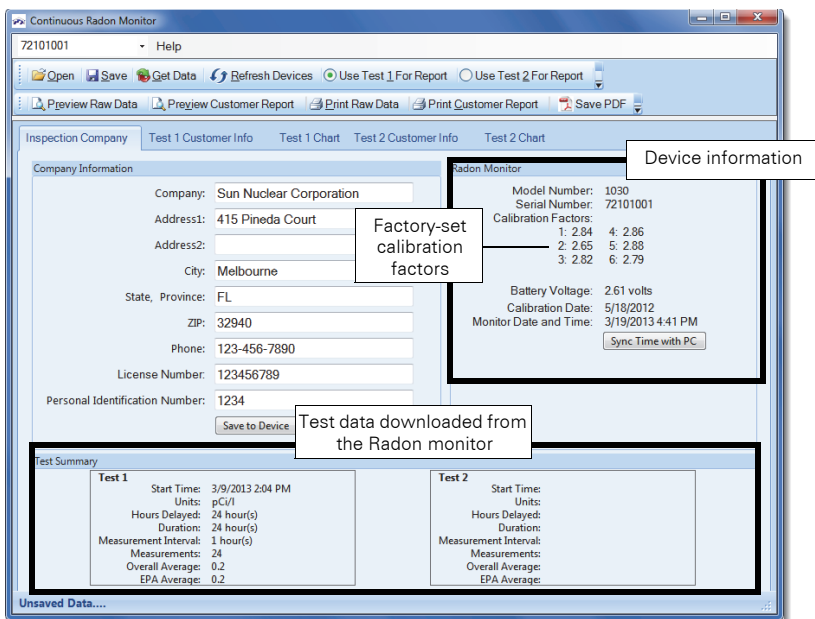


Figure 13. Radon Monitor Information

Retrieving Data from the Monitor



Note: To retrieve data from the Radon Sentinel, the display on the unit should show **READY TO TEST**, **TEST COMPLETE**, or **MEMORY FULL**.

- 1 Connect the Radon Sentinel to the computer and launch the Continuous Radon Monitor software. The serial number of the device appears in the text box above the toolbar when the monitor is detected (Figure 12)
Tip: If the Radon Sentinel is not automatically detected by the software, click **Refresh Devices**.
- 2 On the software toolbar, click **Get Data** to synchronize the data on the Radon Sentinel with the software.
- 3 The software retrieves the data from the Radon Sentinel (Figure 12).

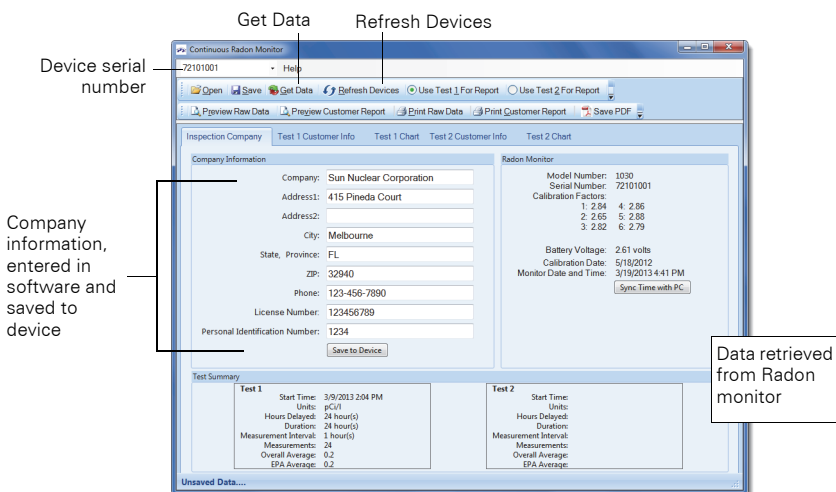


Figure 14. Continuous Radon Monitor Main Screen

Displaying Test Summary Data

The Test Summary panel displays a summary of downloaded data. If two tests were in memory on the Radon Sentinel, the software displays both sets.

The data cannot be edited; however, you can indicate the presence of a mitigation system and whether or not that system is working. See *Setting up Customer Information* on page 19.

- 1 Connect the Radon Sentinel to the computer and then start the Continuous Radon Monitor software.
- 2 If more than one device is connected, select the device to work with from the drop-down list above the toolbar and then click **Get Data**.

A summary of any downloaded tests appears in the Test Summary panel on the *Inspection Company* tab.

Start Time	Date and time the test started. The time shown will be the time the actual measurement begins.
Units	The units selected for the test: pCi/l or Bq/m ³ .
Hours Delayed	Number of hours, if any, that the start of the test was delayed.
Duration	Length of the test, in hours:
Measurement Interval	Length of time between consecutive measurements
Measurements	The number of measurements taken during the test.
Overall Average	The average of radon concentration over the entire test.
EPA Average	The radon concentration average, less the first 4 hours of data.

Setting up Customer Information

Details such as a customer's name and billing/site information for a test are entered using the *Test 1* or *Test 2 Customer Info* tabs. This information is included on the customer report.

- 1** After downloading test data, click the **Test 1 Customer Info** tab. Two panels display (Figure 15):
 - In the *Customer Billing Address* panel, enter the name, address, and phone number to which the test will be billed.
 - If the inspection site address is the same as the billing address, click the double arrow between the panels to copy *Customer Billing Address* information to *Inspection Site Address* panel. Otherwise, complete the *Inspection Site Address* panel with the information for the site tested.
- 2** If a radon mitigation system was installed at test site, select the check box associated with **Mitigation System Exists?** If a radon mitigation system was working, select the check box associated with **Mitigation System Working?**
- 3** To add photo(s):
 - a. Enter an optional caption in the *Picture Caption* text box. Note that the first image imported will appear on the cover page of the report.
 - b. Click the browse button and navigate to the location of the photo.
 - c. Select a photo and click **Open**. Photos cannot be deleted or edited, however they can be excluded from a report by clicking the thumbnail of the photo (click again to include).

Tip: Photos are not saved with raw data, so to remove unwanted photos, save, close, reopen the saved file, and then add the desired photos.
- 4** If two tests were downloaded, click the **Test 2 Customer Info** tab and then repeat steps 1 through 3 for the second test.

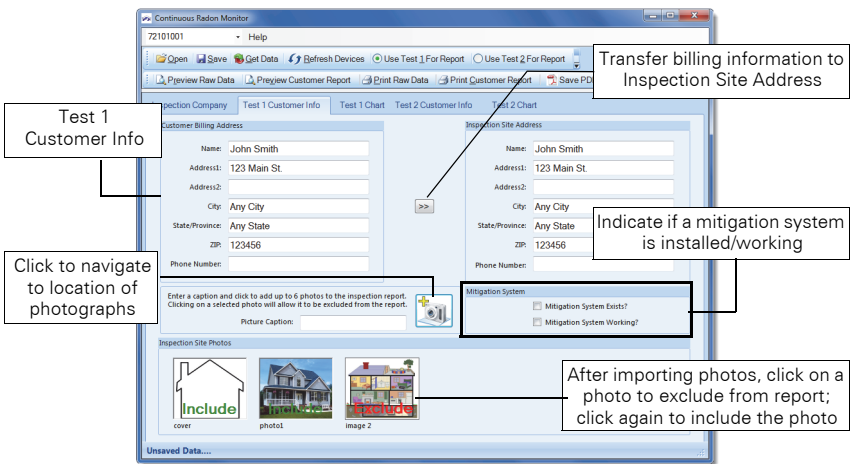


Figure 15. Entering Customer and Site Information

Test Chart Views

The *Test 1 Chart* and *Test 2 Chart* tabs show a chart or graph of the test results. The chart is included in the test report. If two tests are downloaded from the Radon Sentinel, *Test 1 Chart* will display the data for test 1 and *Test 2 Chart* will display the data for test 2. Use the instructions below for viewing the chart data.

- 1 After downloading test data, click the **Test 1 Chart** tab.
- 2 Select **Test 1 Chart** in the navigation panel (Figure 16).

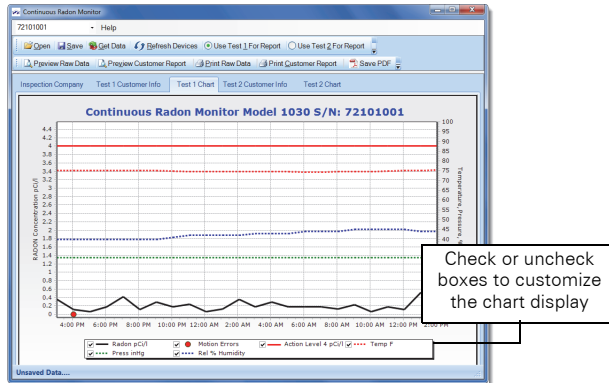


Figure 16. Test 1 Chart Example

- Left scale indicates the Radon concentration in the units selected for the test: pCi/l or Bq/m³.
- Right scale shows temperature (in C or F), pressure (inHg or kPa), and percent relative humidity, depending on the units selected for the test.
- Horizontal scale shows date and time range for the test. If test duration was one day or less, scale shows hourly increments.
- Check boxes below the chart can be used to select the components that are visible in the chart.

Radon <pCi/l or Bq/m³> Displays periodic radon measurements graph line.

Motion Errors Displays vertical motion error lines (motion errors occur when device is moved during the test).

Action Level <nn pCi/l or Bq/m³> Displays a horizontal line indicating the point at which radon test passes or fails (defaults to 4 pCi/l or 148 Bq/m³). If the average is above the red line, the test fails; if it is below the line, the test passes. If the default setting does not match the regulatory level in your jurisdiction, deselect the checkbox to hide it.

Temperature <C or F> * Displays temperature graph line in units selected for test.

Press <units> * Displays pressure graph line in units selected for test.

Rel % Humidity Displays relative percent humidity graph line.

* The parameters selected on the Radon Sentinel (pCi/l or Bq/m³) determines the units used for temperature, pressure, and humidity.

Saving a Test

Data retrieved from the monitor can be saved to a .txt file. Note that if two tests are retrieved, data for both tests are saved in the same .txt file.

- 1 Retrieve data from the monitor. See *Retrieving Data from the Monitor* on page 17.
- 2 On the toolbar, click **Save**.
- 3 When the 'Select Folder and Filename' window opens, browse to the directory where the file will be saved, enter a file name or accept the default, and then click **Save**.
 - By default, the software creates a folder for saved data in My Documents: Completed Tests.
 - If a **billing** address was entered for the test, the file name will default to <Address1>_mmddyyyy.txt.

For example, if *123 Main St* is entered in the Address1 field for the billing address for a report, and the report is saved on *12/15/2011*, the report name defaults to: **123 Main St_12152011**.

- After test data is saved, the status bar at the bottom of the Continuous Radon Monitor window displays the name of the saved file.

Open a Saved File



Note: *Saved files can only be opened using the same date and time formats that were in use when the data was saved. For example: When the data was saved, if the date format was set to **mm/dd/yyyy** and the time format was **h:mm:ss:tt**, the file can only be opened on a computer configured with the same settings.*

- 1 Launch the Continuous Radon Monitor software.
- 2 On the toolbar, click **Open**.
- 3 When the 'Open Past Inspection' window displays, browse to the directory where the text files are stored, select the desired file, and then click **Open**. The data is populated in the software.

Previewing and Printing Test Data

Raw data is the test data that is downloaded from the Radon Sentinel and saved to a *.txt file on the computer. Previewing and printing the raw data requires that the test results be saved to a file.

Preview Raw Data

The .txt file can be opened in a viewer by clicking **Preview Raw Data** on the Continuous Radon Monitor software toolbar. The data in the .txt file is used to create a report. Raw data cannot be edited. See *Saving a Test* above

- 1 Download test data and save it (see *Saving a Test* on page 21), or open a saved file (see *Open a Saved File* on page 21).
- 2 Click **Print Raw Data**. The data opens in a separate 'Print Preview' window. Use the toolbar buttons to view the data.

Maximize window	View the window in full screen mode.
Zoom	Increase or decrease the magnification of text (Auto, 500%, 200%, 150%, 100%, 75%, 50%, 25%, 10%)
Page layouts	One page, Two pages, Three pages, Four pages, Six pages – select the number of pages to fit in a single window
Close	Close the preview window.
Pages (right side)	Scroll through the pages using the up/down arrows.

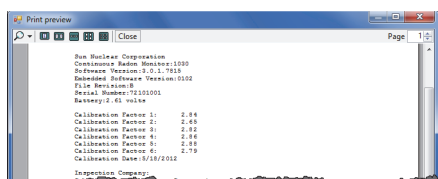


Figure 17. Previewing Raw Data

Print Raw Data

Raw test data that has been downloaded and saved can be printed to a local printer or a network printer.

- 1 Download test data and save it (see *Saving a Test* on page 21.), or open a saved file (see *Open a Saved File* on page 21).
- 2 On the toolbar, click **Print Raw Data**.
- 3 The 'Print' dialog opens with your default printer selected. Configure printer properties if necessary and click **OK**.

Customer Reports

Data that has been downloaded and saved is used in the customer report, and can be used to create a PDF of the customer report.

Preview Report

The **Preview Customer Report** option opens a window so you can view the report before printing it. Data from the Radon Sentinel must be saved before previewing the report. A report contains the following elements:

- Cover page image, if specified in the Customer Information tab. See *Setting up Customer Information* on page 19.
- Customer and site information, if configured. See *Setting up Customer Information* on page 19.

- Inspection company information. See *Setting up Customer Information* on page 19.
- Information identifying the device used for the test (model, serial number, calibration date, calibration factors, start time for the test, units specified for the test, delay, duration, measurement interval, number of measurements, the overall average, and the EPA average).
- A chart of the data collected.
- Radon risk information.
- Any photos that were added on the Customer Info tab. See *Setting up Customer Information* on page 19.

The number of pages in the report will depend on the options configured for the report.

- 1 Download test data and save it, or open a saved file.
- 2 On the toolbar, if there are two reports open, select the radio button for the test to be printed: **Use Test 1 For Customer Report** or **Use Test 2 For Customer Report**.
- 3 Configure the customer information and import photos if desired.
- 4 Click **Preview Customer Report**. The selected report opens in a new window (Figure 18). The viewer's toolbar offers viewing options.

Maximize window	View the window in full screen mode.
Zoom	Increase or decrease the magnification of text (Auto, 500%, 200%, 150%, 100%, 75%, 50%, 25%, 10%)
Page layouts	One page, Two pages, Three pages, Four pages, Six pages – select the number of pages to fit in a single window
Close	Close the preview window.
Pages (right side)	Scroll through the pages using the up/down arrows.

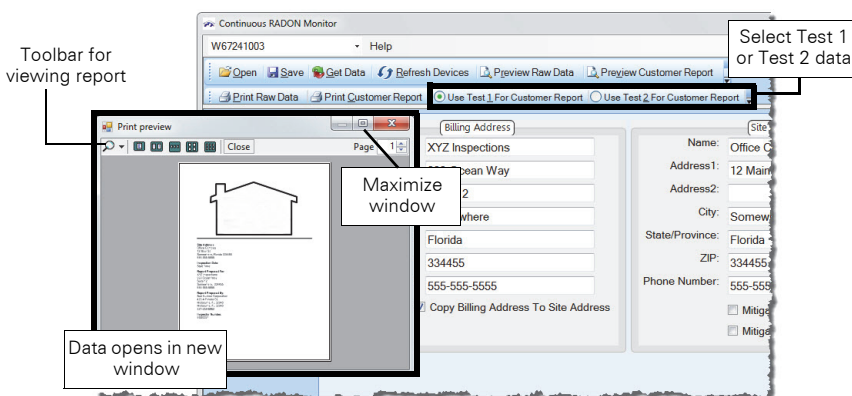


Figure 18. Preview Report

Print Report

- 1 Download test data and save it or open a saved file.
- 2 On the toolbar, if there are two reports open, select the radio button for the test to print: **Use Test 1 For Customer Report** or **Use Test 2 For Customer Report**.
- 3 Configure the customer information and import photos if desired.
- 4 Click **Print Customer Report**.
- 5 In the 'Print' dialog, select the printer to use and configure printer properties if necessary.
- 6 Click **OK**.

Save PDF

To save report data with imported images, save the report as a PDF.

- 1 Download test data and save it or open a saved file.
- 2 On the toolbar, if there are two reports open, select the radio button for the test to print: **Use Test 1 For Customer Report** or **Use Test 2 For Customer Report**.
- 3 Configure the customer information for the report
- 4 Click **Save PDF**.
- 5 The PDF file opens in a new window. Use the toolbar buttons or menu items to save or print the file.

Specifications

Model 1030 Radon Sentinel Specifications

Table 2. Model 1030 Radon Sentinel Specifications

Description	Value
Measurement Range	0.1 to 9999 picocuries/liter (pCi/l) or 1 becquerels per cubic meter (Bq/m ³) to 99.99 kilo becquerels per cubic meter (kBq/m ³)
Accuracy	±20% or 1 pCi/l, whichever is greater after 24 hours
Detector	Diffused-junction photodiode - Model 1028: quantity 1 - Model 1029: quantity 2 - Model 1030: quantity 6 Active volume: 9.4 cm ³ Dome volume: 63 cm ³
Measurement Interval	0.5, 1, 2, 4, 8, 12, 16, 20 or 24-hour intervals, selectable by user
Test Duration	1, 12, 24, 36, 48, 60, 72, 84, 96, 100, 999 hours, selectable by user (maximum of 720 measurements)
Sensitivity	1028: 3 counts per hour per picocurie per liter (cph/pCi/l) 1029: 6 counts per hour per picocurie per liter (cph/pCi/l) 1030: 15 counts per hour per picocurie per liter (cph/pCi/l)
Display	16-digit reflective LCD display
Status Light	Green LED (light emitting diode) indicates USB to PC connection
Keypad	6-digit membrane switches with multiple functions
Disturbance Sensor	Inertial switch; report shows "M" for motion
Environmental sensors	- Temperature: 0 to 120 ± 2 degrees F -18 to 49 ± 1 degree C) - Pressure: 10 to 15 ± 0.5 psi 69 to 104 kPa +/- 3 kPa - Humidity: 20 to 90% relative humidity ± 5%
Operating Environment	45 to 95° F (7 to 35° C) 20 to 90% relative humidity, non-condensing
Storage Environment	-22 to 122° F (-30 to 50° C) 10 to 90% relative humidity, non-condensing
USB Data Port	USB connector allows two-way communication with PC
Power Supply	110-240 VAC 50-60 Hz converted to 5 VDC 500 mA USB connection/power adapter
Battery Power/Backup	Four size C alkaline (non-rechargeable) batteries supply 300+ hours of operation when AC power is not connected.
Tripod threaded fitting	Standard 1/4-20 UNC threaded fitting on bottom of case
Handle	Integrated handle for carrying or for use with cable lock
Weight	3.75 lbs (1.7 kg)
Dimensions	5.5 W x 9.6 H x 4.4 D inches; (139.7 x 243.84 x 111.76 mm)

Radon Software Recommended System Requirements

Table 3. Radon Sentinel Software Specifications

Characteristic	Recommendation
Operating system	Windows XP or Windows 7, any edition (32- or 64-bit)
Computer hardware	Hard disk space: 850 MB CPU speed: 1.6 MHz Total physical memory (RAM): 512 MB Video card: 1024 x 768, 32-bit color depth USB version: 1 USB v2.0 port (minimum)
PDI 2.0 driver version	Requires version (as of date of this document: 2.08.08)
Microsoft .NET Framework	Version 4.0

Service

Maintaining Hardware

Parts and Repairs

Order accessories and replacement parts from Sun Nuclear Sales.

For part numbers, see *Parts* on page 1. For accessory part numbers, see *Options and Accessories* on page 2.

There are no user-serviceable parts inside the Radon Sentinel. If there are problems with the device, please contact Sun Nuclear Customer Support. See *Contacting Sun Nuclear Support* on page 30.

Storage

Store the Radon Sentinel in an indoor, protected environment. Do not store the device in the trunk of a car for extended periods. Keep the device dry.

Cleaning

Clean the unit with a soft dry cloth. Do not use liquid cleaners, solvents, or abrasives.

Disposing and Recycling

Do not discard unit as waste; the circuit board contains small amounts of lead. Recycle the components in accordance with local regulations.

Battery Life

Any type of size C battery will operate the Radon Sentinel, but an alkaline battery provides a good balance between long life and cost. Since battery capacity varies widely between types of batteries and even between individual batteries of the same type, the predicted battery life of 300+ hours using fresh alkaline batteries. An individual unit may have longer or shorter life.

Maintaining Software

The CD distributed with the Radon Sentinel contains the latest released software version as of the shipment date; however, upgrades or patches may be available later. When available, these upgrade can be downloaded from the Sun Nuclear Radon Support web page. For more information, see *Contacting Sun Nuclear Support* on page 30.

Verifying Software Version

- 1 Launch the Continuous Radon Monitor software.
- 2 Connect to the radon monitor.
- 3 Select **Help > About** from the menu. The *About Radon Monitor* message displays the version number of the software.

Removing Software

To remove the Continuous Radon Monitor software from the computer, use the instructions below for the operating system installed on the computer.

Windows XP

- 1 Open the **Control Panel** and then select **Add or Remove Programs**.
- 2 In the list of programs, select **Radon Monitor** and then click **Remove**. This will remove all of the radon monitor program files.

Windows 7

- 1 Click **Start > Settings > Control Panel** then select **Programs and Features**.
- 2 In the list of installed programs, select **Radon Monitor** and then click the **Uninstall** button.

Multiple Software Installations

- **Two or More Radon Sentinel Units** – The Continuous Radon Monitor software only needs to be installed on a computer one time, regardless of the number of radon monitor units being used with that computer.

When connecting to a radon monitor, the software identifies the serial number of the connected radon monitor and creates a unique serial number directory for each radon monitor instrument. During measurement, the setup template includes the serial number, which is validated against the radon monitor instrument communicating data to the PC.

- **Two or More Computers** – If you have more than one computer, the radon monitor software may be installed on each.

Service and Calibration



WARNING: The unit contains high-voltage circuits. Do not open the case. There are no user-serviceable parts inside.

For service or calibration, return the unit to Sun Nuclear Corporation as instructed in the Warranty statement on the inside back cover of the User's Guide.

The manufacturer's recommended calibration frequency for the model 1030 Radon Sentinel is one year. See your state or Proficiency listings for requirements.

Troubleshooting

Table 4. Model 1030 Radon Sentinel Troubleshooting

Indication	Probable Cause	Recommended Action
Unit will not turn on	Power not connected and batteries are missing or discharged.	Connect power and/or insert four fully charged size C alkaline batteries.
Unit will not turn on with power connected or good batteries	Internal short or disconnection.	Contact Sun Nuclear Customer Support. Unit will need to be returned.
System error message	Radon monitor experienced an abnormal condition.	See <i>Radon System Error Codes</i> on page 29.
Radon Sentinel serial number not displayed in software	Radon monitor not detected by the software	Click Refresh Devices . The serial number displays when the connection is detected.
Display shows "Motion Detected" but motion not recorded on report	Test interrupted before being completed. Motion occurred as test was terminated.	Print results and count number of measurements. If less than expected, test terminated prematurely. Rerun test.
Software error message	Error messages display when starting the Continuous Radon Monitor application or when retrieving data from the Radon monitor: • Humidity Sensor Error 1 • Pressure Sensor Out of Range • Humidity Sensor Out of Range • SPI Port Error • Dead Channel • Memory Error • Test Interval Alpha Count Overflow • Test Hourly Alpha Count Overflow • High Voltage Out of Range • Interboard comm error	Contact Sun Nuclear Customer Support. See <i>Contacting Sun Nuclear Support</i> on page 30.

Radon System Error Codes

An error message will appear on the Radon Sentinel display if the device experiences an unusual system error. Normally this indicates a hardware or firmware failure. Make a note of the 8-digit error code and then contact Sun Nuclear Customer Support for assistance. See *Contacting Sun Nuclear Support* on page 30.

Contacting Sun Nuclear Support

You may request support in two ways:

- Use our online form. See *Radon Support Web Page* below.
- Contact the Sun Nuclear Support team by telephone: +1 321-259-6862

Radon Support Web Page

The Sun Nuclear Support web page for Radon devices offers online support 24 hours a day, 7 days a week:

The Radon Support web site can be used to:

- Submit service requests for calibration and repair online.
- Pay for calibration and repair online.
- Access a comprehensive list of frequently asked questions.
- View video tutorials for many common inquiries.

Regulatory Supplement

Conventions

- **Bold** typeface indicates a button name or an entry that the user must type.
- *Italicized* typeface indicates the title of a manual or introduces a new term or phrase.
- ***Bold italicized*** typeface indicates a menu option.
- "Text in double quotes" indicates a message that is displayed to the user or a cross-referenced subsection within this manual.
- 'Text in single quotes' indicates the name of a window or dialog box.

Sun Nuclear Corporation Symbols

The following symbols are used in this document and in Sun Nuclear Corporation's product labels.



WARNING: Possible impact to personal safety.



CAUTION: Cautionary statement.



Note: *Important or supporting information.*



Manufacturer's Identification (name and address).



Date of Manufacture.

SN

Serial Number.

REF

Catalog Number.



Consult instructions for use.

Operator Responsibility

This guide is intended for an operator who is experienced with the use of radon detection devices. The device and its accessories must not be used for any purpose other than described in this manual. Violation may result in loss of warranty.

Operating Information

- Do not use any cable that is damaged or has broken insulation. Replace the cable immediately.
- Do not permit water or any other liquids to spill onto the instrument.
- Inspect all cables periodically for damage. If any mechanical or electrical degradation is suspected, contact Sun Nuclear Corporation for repair or replacement.

Additional Information

Application Help — Help is available by selecting **Help > Contents** from the menu bar of the Continuous Radon Monitor software. The application help contains the same information as the *Radon Sentinel User's Guide*.

About Radon

The U.S. Environmental Protection Agency (EPA) maintains a comprehensive web site on radon at: <http://www.epa.gov/radon/> where you can find PDF and HTML-ready versions of all of the EPA's documents, brochures, and publications relating to radon.

Below are descriptions of three of the more common EPA publications on radon, copied from site

A Citizen's Guide to Radon — *The guide to protecting yourself and your family from radon.* This resource offers strategies for testing your home for radon and discussions of what steps to take after you have tested, as well as discussions about the risk of radon and radon myths. EPA 402/K-09/001, January 2009.

Home Buyer's and Seller's Guide to Radon — This booklet is intended for anyone who is buying or selling a home, real estate and relocation professionals, home inspectors and others. EPA 402/K-09/002, January 2009.

Consumer's Guide to Radon Reduction — *How to Reduce Radon Levels in Your Home...* This recently revised booklet is for people who have tested their home

for radon and confirmed that they have elevated radon levels. This booklet can help you: select a qualified contractor to reduce the radon levels in your home, determine an appropriate radon reduction method, and maintain your radon reduction system. EPA 402-K-06-094, December 2006.

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Warranty

1 Instrumentation

- a. This instrument and its accessories, excluding those listed in 1.D. below, are warranted by SUN NUCLEAR CORPORATION, against defects in materials and workmanship for a period of one year from the date of original purchase from SUN NUCLEAR CORPORATION. During the warranty period, SUN NUCLEAR CORPORATION will repair, or at its option, replace an instrument found to have such defect, at no charge to the customer.

THERE ARE NO WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING WITHOUT LIMITATION, ANY IMPLIED WARRANTY OF MERCHANTABILITY OF FITNESS, WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF. THIS EXPRESSED WARRANTY EXCLUDES COVERAGE OF AND DOES NOT PROVIDE RELIEF FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND OR NATURE, INCLUDING BUT NOT LIMITED TO LOSS OF USE, LOSS OF SALES, OR INCONVENIENCE. THE EXCLUSIVE REMEDY OF THE PURCHASER IS LIMITED TO REPAIR, RECALIBRATION, OR REPLACEMENT OF THE INSTRUMENT AT THE OPTION OF SUN NUCLEAR CORPORATION.

- b. This warranty does not apply if the product, as determined by SUN NUCLEAR CORPORATION, is defective due to either abuse, misuse, or modification or service performed by someone other than a SUN NUCLEAR CORPORATION authorized repair and calibration facility. Misuse and abuse include, but are not limited to, subjecting the instrument to environmental conditions outside the specified limits or allowing the instrument to become contaminated by radioactive materials.
- c. In order to obtain warranty repair service, the instrument must be returned, freight prepaid, to the facility cited in 3.b. below. The purchase date, vendor invoice, or customer purchase order should be included, along with a statement of the problem. Instruments will be returned transportation prepaid to points within the United States.
- d. Because the original manufacturer's warranty applies, the following items are specifically excluded from this warranty: photomultiplier, Geiger-Mueller, and proportional tubes; batteries; ancillary devices, including, but not limited to, printers, computers, display devices, etc.; and other components as may be specified in this manual.

2 Calibration

- a. This instrument is warranted to be within its specified accuracy at the time of shipment. If a question arises and SUN NUCLEAR CORPORATION determines that the initial calibration is in error, the instrument will be re-calibrated by SUN NUCLEAR CORPORATION at no charge. SUN NUCLEAR CORPORATION is not responsible for calibrations performed by independent laboratories, nor any calibration fees incurred prior to or subsequent to SUN NUCLEAR CORPORATION warranty service.
- b. The return policy is as stated in 1.c. above.

3 Non-warranty Service

- a. Repairs and/or replacements not covered by this warranty may be performed by SUN NUCLEAR CORPORATION or a factory authorized service location. Estimates of repair charges may be requested; however, a charge for estimate preparation may apply if the repair is later not authorized by the customer.

The cost of transportation into and out of the service location will be the responsibility of the customer. The instrument should be shipped to:



SUN NUCLEAR
corporation

Corporate Headquarters
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Melbourne, Florida 32940-7514
tel: +1 321 259-6862
web: radon.sunnuclear.com